Radiological Agents: General Guidance*

Diagnosis: Be Alert to the Following:

- Acute radiation syndrome (Table 1) follows a predictable pattern after substantial exposure or catastrophic events
- Victims may also present individually, as described in Table 2, over a longer period of time after exposure to contaminated sources hidden in the community
- Specific syndromes of concern, especially with a 2-3 week prior history of nausea and vomiting, are
  - thermal burn-like skin lesions without documented heat exposure
  - immunological dysfunction with secondary infections
  - a tendency to bleed (epistaxis, gingival bleeding, petechiae)
  - marrow suppression (neutropenia, lymphonenia, and thrombocytopenia)
  - epilation (hair loss)

Information source: the Employee Education System for the Office of Public Health and Environmental Hazards, Department of Veterans Affairs

* The information in this card is not meant to be complete, but to be a quick guide. Please consult other references and expert opinion and check drug dosages, particularly for pregnancy and children.

Understanding Exposure

- Exposure may be known and recognized or clandestine as
  - large radiation exposures, such as a nuclear bomb or catastrophic damage to a nuclear power station
  - small radiation source emitting continuous gamma radiation producing chronic intermittent exposures (such as radiological sources from medical treatment or industrial devices)
  - skin contamination with radioactive material (“external contamination”)
  - internal radiation from absorbed, inhaled, embedded, or ingested radioactive material (“internal contamination”)

Confirmation and Sources of Assistance and Support

- Contact radiation safety officer (RSO) or Nuclear Medicine Physician for help
- To consult with DoD radiobiology experts, contact
  - Radiological Advisory Medical Team (RAMT) 800-759-8888
    - RAMT Officer Skytel Pin #: 1575809
    - RAMT Physician Skytel Pin #: 1087387
  - Medical Radiobiology Advisory Team (MRAT)
    - Duty Hours: 301-295-0316
    - After Hours: 301-295-0530
- Obtain complete blood count with differentials every 6 hours
  - absolute lymphocyte count <1200 mm^3 suggests moderate exposure
  - absolute lymphocyte count <500 mm^3 suggests severe exposure
  - acute, short-term rise in neutrophil count
- Swab both nares and separate the samples to prevent cross-contamination
- Collect 24 hour urine if internal contamination with radionuclides is possible
- CDC ATSDR Hotline 770-488-7100

Decontamination Considerations

- Patient with life-threatening condition: treat, then decontaminate
- Patient with non-life-threatening condition: decontaminate, then treat
- Contaminated patients do not present a significant hazard to medical personnel
- Exposure to a beam of radiation does not contaminate a patient. Patient contamination generally results from contact with radioactive particles.
- Treating contaminated patients before decontamination may contaminate the facility: plan for decontamination before arrival
- Exposure without contamination requires no decontamination (RSO measurement)
- Exposure with contamination requires Standard Precautions, removal of patient clothing, and decontamination with soap and water
- For internal contamination, contact the RSO and/or Nuclear Medicine Physician

Treatment Considerations

- If life-threatening conditions are present, treat them first
- If external radioactive contaminates are present, decontaminate
- If radioiodine (reactor accident) is present, consider protecting the thyroid gland with prophylactic potassium iodide if within first few hours only (ineffective later, see Table 3)
- Review http://www.afrii.usuhs.mil/www/outreach/pdf/2edmmrchandbook.pdf or http://www.oqp.med.va.gov/cpg/bcr/bcr.base.htm

Institutional Reporting

- If reasonable suspicion of a radiation event, contact hospital leadership (Chief of Staff, Hospital Director, etc.)
- Immediately discuss hospital emergency planning implications

Public Health Reporting

- Contact local public health office (city, county or state)
- If needed, contact the FBI (for location of nearest office, see http://www.fbi.gov/contact/fo/fo.htm

Table 1: Acute Radiation Syndrome

1 Gray (GY) = 100 rads 1 centiGray (cGy) = 1 rad

Whole body radiation from external radiation or internal absorption				
Phase of Syndrome	Feature	Subclinical range		
		0 - 100 rad or cGy	100 - 200 rad/1- 2 Gy	
Prodromal Phase	Nausea, vomiting	none	5-50%	
	Time of onset		3-6 hours	
	Duration		<24 hours	
	Lymphocyte count	Unaffected	Minimally decreased	
	CNS function	No impairment	No impairment	
Latent phase (subclinical)	Absence of Symptoms	> 2 weeks	7-15 days	
Acute Radiation Illness or "Manifest Illness" phase	Signs and Symptoms	none	Moderate leukopenia	
	Time of Onset		> 2 weeks	
	Critical Period		none	
	Organ System	none		
Hospitalization	% Duration	0	<5% 45-60 days	
Mortality		None	Minimal	

Whole body radiation from external radiation or internal absorption

	Sublethal range		Lethal range	
	200-600 rad/2-6 Gy	600-800 rad/6-8 Gy	800-3000 rad/8-30 Gy	>3000 rad >30 Gy
	50-100%	75-100%	90-100%	100%
	2-4 hours	1-2 hours	<1 hour	Minutes
	<24 hours	<48 hours	<48 hours	N/A
	<1000 at 24 hours	<500 at 24 hours	Decreases within hours	Decreases within hours
	Routine task performance Cognitive impairment for 6-20 hours	Simple, routine task performance Cognitive impairment for >24 hours	Rapid incapacitation, often after a lucid interval of up to several hours	
	0-7 days	0-2 days	None	None
	Severe leukopenia, purpura, hemorrhage; Pneumonia; Hair loss after 300 rad/3 Gy		Diarrhea; Fever; Electrolyte disturbance	Convulsions, Ataxia, Tremor, Lethargy
	2 days - 2 weeks		1-3 days	
	4-6 weeks - Most potential for effective medical intervention		2-14 days	1-48 hours
	Hematopoietic and respiratory (mucosal) systems		GI tract; Mucosal systems	CNS
	90% 60-90 days	100% 90+days	100% weeks to months	100% days to weeks
	Low with aggressive therapy	High	Very high, significant neurological symptoms indicate lethal dose	

Table 2: Symptom Clusters as Delayed Effects after Radiation Exposures

Headache Fatigue Weakness	Partial and full thickness skin damage Epilation (hair loss) Ulceration
Anorexia Nausea Vomiting Diarrhea	Lymphopenia Neutropenia Thrombopenia Purpura Opportunistic infections

Table 3: Potassium Iodide Dosages

The dose of potassium should be taken once a day until a risk of significant exposure to radioiodines no longer exists*

Age group	Dosage
Infants < 1 month	16 mg
Children 1 month-3 years	32 mg
Children 3-18 years	65 mg
Adults	130 mg

*For information regarding preparation of potassium iodine solution: http://www.fda.gov/cder/drugprepare/kiprep.htm